

# Get 100-Plus Mile Mobile Range on VHF Sideband!—Part 1

Here's a practical guide to going SSB-mobile on the "weak-signal" portions of our VHF and UHF bands—and talking farther than you ever thought possible! In Part 1, K1MAP covers the nuts and bolts of putting together an SSB mobile station.

By Mark Casey, K1MAP\*  
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**H**ow many of you have had this happen? You've had a VHF base station for years, and maybe even dabbled a bit in VHF SSB weak-signal work. Every once in a while, you run into a mobile station out there. You think he's going to say, "Oh, I'm just down the road a few miles from you," but no...he's 150 miles away.

It only had to happen to me a couple of times before I started asking some serious questions about mobile operation on VHF. Pretty soon my 25-watt, 2-meter all-mode rig ("all-mode" is usually a misnomer; these radio's most often come with SSB, FM, and CW, but not AM) had a bracket for itself in my van, along with a dedicated 14-inch "halo" antenna mounted on the back of the vehicle. What could I do with this setup? Would anyone be on? More importantly, would anyone hear me? I wasn't sure, but the real fun part was next.

## The First Contacts

"OK," I thought, "let's give it a whirl—get in the van and try a couple of CQs." Local station WZ1V, Ron Klimas, answered my call and asked me if I was a base station. That's one of the best compliments a mobile station can get—being

*\*Mark Casey, K1MAP, lives in Hampden, Massachusetts, and enjoys VHF/UHF/microwave operation from home, mobile, and while hiking. "I love those hilltops," says Mark.*



Photo A. The author and his mobile SSB station. His setup was much simpler to start with (one rig and one antenna) and yours can be, too. (All photos by the author)

mistaken for a base! Ron was about 40 miles away, not bad for the first try in the driveway. But I figured the true test would be seeing if I could make any contacts while in motion.

My job involves a lot of driving, and that day I had several hours of "wind-shield time" planned. After a half-hour or so of on-off CQing, a low to moderate strength station answered. It was the late Tom Kirby, W1EJ (now a silent key). Tom gave me a decent signal report and I could hear every word he said, from 120 miles away! Remember, there are no repeaters on SSB...but Tom was running 500 watts and four antennas. Fortunately, similar setups are common among side-

band operators, and they will greatly extend the working range of a mobile station by compensating for your generally low power and omnidirectional antenna.

Another great opportunity for mobile operating is vacation time, especially if you're driving through heavily populated areas, such as down the East Coast along I-95 for that winter respite in Florida (I live in New England). My family and I did this about three years ago, and I took full advantage of the drive to wake up every 2-meter sideband station I could between Hartford, Connecticut, and Key West, Florida!

I really started a pileup one evening around Daytona Beach. We were headed

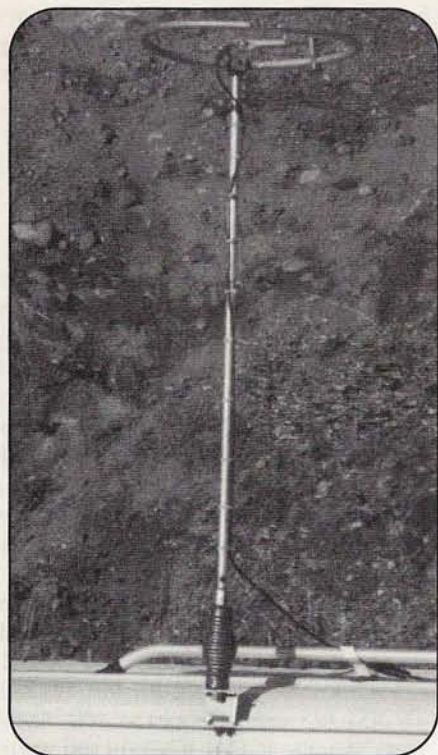


Photo B. The halo and its squared-off cousin, the squalo, are among the best choices for SSB mobile operation. They're available from a variety of sources.

south at a respectable 60 mph, the wife and two kids tired out and snoozing in the back seat. After the requisite CQs, a local station answered, followed by another about 50 miles away, then another about 100 or so miles downstate. The addition of a 150-watt solid state amplifier was worth it. All of these guys could hear me! Even after we moved off the calling frequency of 144.200, and up to 144.210 MHz, this kept going all evening with anywhere from two to five stations in the fray until we arrived in Ft. Lauderdale around midnight.

This has been the story during several winter vacations. My friend Dean, W4WHN, located in the Florida Keys, and I kept nearly every morning and evening sked that we made on 2-meter sideband while my family was vacationing at various places around the Orlando, Tampa, and St. Augustine areas, a stretch of 200-plus miles. Nearly every time I had a little time to operate, a couple of stations would come back to me.

One nice thing about heading south in the winter is that you get summer back, and, in Florida, it comes back with regular tropospheric ducting openings throughout the winter season. The typi-

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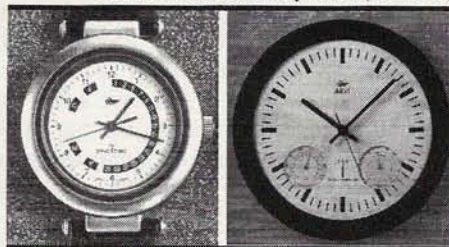
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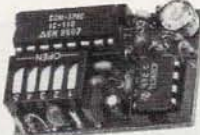
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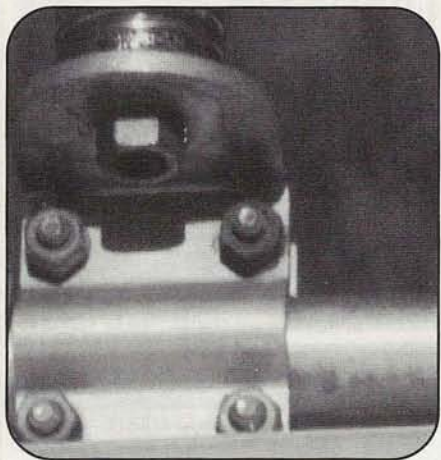


Photo C. RadioShack's mirror and luggage-rack mount is a good candidate for attaching a halo antenna to your car.

cal range of 50 to 100 miles becomes 100 to 200 miles, especially during the early morning, slightly before sunset and for a couple hours afterward.

## Planning Your Station

Have I talked you into it yet? Here's another good reason to try SSB mobile on VHF: It's easy to get on, with a wide choice of equipment available for the 6-meter, 2-meter, and 70-centimeter bands. This leads to the first "most commonly asked questions" answer. Yes, you get FM and CW along with SSB on all current model sideband VHF rigs and that feature makes mobile operation even more attractive, since the same radio can hook you up with FM repeaters if you need help or directions. (Properly tuned, most of the antennas we'll talk about soon

will perform fairly well in the FM sections of their respective bands too!) There are a couple of older model rigs with SSB only, but these are few and far between. On the other end of the spectrum, the HF/VHF ICOM IC-706 and Alinco DX-70T/TH also have AM!

Now, let's get down to the nitty gritty of setting up an SSB mobile station. Remember, we're not talking about a full-blown rover setup here, just a mobile SSB station for everyday fun. My current setup is shown in Photo A. Let's take first things first and the first two things are: A) Budget, and B) Equipment.

Let's look at B first, then figure out how to make it fit into A. You're going to need a transceiver, mobile mount, antenna, antenna mount, some coax, a power cord, and, if you have a few extra bucks, an amplifier. In the tug of war between budget and obtaining the guts of the project, see if you fall into one of these three categories:

1. *Scrounger*: Search hamfests, swap lists and nets for used rig (single band), parts, etc. Maybe build your own mounts and antenna. Total: \$300–\$500.

2. *Comfortable*: Used or new rig, maybe for more than one band; purchase mounts, and maybe an amp. You might want to have some fun building your own antenna. Total: \$500–\$1500.

3. *Hogwild*: New rig(s), more than one band, amplifiers, several antennas. Total: \$1500 and up.

OK, you guessed it, I'm a class AAA scrounger, too! If you've got the time, the budget station will perform as well as the store-bought one. The key ingredient

here is perseverance in attending hamfests, listening to swap nets, and reading the swap pages in local club newsletters and national publications. In addition, some dealers have great deals on traded-in merchandise, so keep your eyes open.

## Which Rig Should I Use?

For those in the scrounger category, the choices are limited to a few older rigs like the ICOM IC-202 (8 watts on 2 meters, USB/CW only), the Yaesu FT-480 (10 watts on 2 meters, SSB/CW/FM), the Yaesu FT-290/first generation (2 watts on 2 meters, SSB/FM/CW), and the KLM Echo II (5 to 10 watts on 2 meters, USB/CW only). Most of these manufacturers also made similar rigs for 6 meters and 70 centimeters.

If you can squeeze into the comfortable group, your choices widen. In the used rig department, add the Kenwood TR-751 (25 watts on 2 meters, SSB/FM/CW) and TR-851 (25 watts on 430 to 440, SSB/FM/CW), the ICOM IC-706 (100 watts on 6 meters, 10 or 20 watts on 2 meters and 100 watts on HF! SSB/FM/CW/AM). In the new rig department, you'll like the single band Yaesu FT-290/R11 (2 or 25 watts on 2 meters SSB/FM/CW), the FT-690/R11 (2 or 10 watts on 6 meters, SSB/FM/CW), the FT-790/R11 (2 or 25 watts on 430-450, SSB/FM/CW) series (see February's 10-year review on these models—ed.), Kenwood's TM-255A (40 watts on 2 meters, SSB/FM/CW), TM-455 (35 watts on 430 to 440 only, SSB/FM/CW), and Alinco's multi-band DX70T/TH (10 or 100 watts on 6 meters and 100 watts on HF, SSB/FM/CW).

For those who want to go hogwild, choose any or all of the above, and consider adding 222, 902, 1296, and higher frequency bands. You will need *transverters* for these bands. Downeast Microwave, SSB Electronic, and others make transverters for these bands and others up to and including 10 GHz! A "drive rig" is necessary for transverters. Usually the drive rig is a 2-meter SSB rig that is used as an IF for the transverter and supplies anywhere from 1 milliwatt to 10 watts, depending on the requirements of the transverter. Check space in your vehicle first (maybe you really don't need that front passenger seat)!

## Getting the Signal Out

Selecting an antenna can be tricky. Horizontal polarization works best on

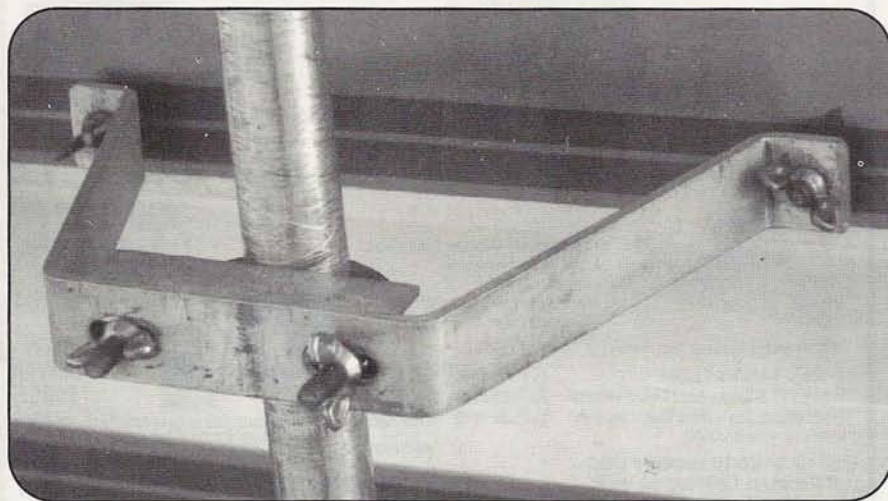


Photo D. Four-inch wall mounts can be used for a serious installation—attach them to a door and you can mount a mast for a beam (see Photo E).



Photo E. If you mount a beam on your vehicle and use it while driving, make sure that it's locked in position and that it doesn't stick out more than 12 inches from the side of the car.

sideband, but may be a bit unwieldy, especially on 6 meters, where the standard halo diameter is 26 inches. You can easily mount these on your vehicle, and they will stand up to even highway speeds. But be prepared for a few funny looks and comments. My favorite one is "Can you talk to the moon?" Answer: yes, if you've mounted an eight-element or longer beam for 2 meters on your ride. (Moon-bounce is technically possible, although you might have to pull over for a few minutes.)

Seriously, the halo/squalo is the best and most durable antenna for any of these bands. The halo is circular (see Photo B) and the squalo is almost square. Both work equally well and take up about the same space. Halos and similar antennas are available from several companies, including KB6KQ, The Olde Antenna Lab, AEA, and M<sup>2</sup>. For mounting the halo, RadioShack offers several types of mounts; my favorite is the #21-937, a mirror and luggage rack mount (Photo C). This can also be used as a gutter

*"If you've got the time, the budget station will perform as well as the store-bought one. The key ingredient here is perseverance...."*

mount—just don't be afraid of using that electric drill!

Several hams here in the northeast have constructed simple dipoles for 2 meters with excellent results! If you want to build your own dipole, you'll need a mount (RadioShack or your nearest ham dealer), an aluminum rod of 1/8- to 1/4-inch diameter, and a durable non-metallic post about 20 to 35 inches long, to which you'll attach the dipole and feedline (a hardwood handle with a base spring works surprisingly well). You may not be able to attach the two dipole elements in exactly the same plane, but a difference of 1/2 inch or so will be insignificant.

The third antenna choice, but only for 2 meters and shorter wavelength bands, is the beam. To mount your beam, you'll need a pair of 4-inch wall mounts (Radio Shack #15-883 or similar; see Photo D). Take the inside panel off of the door of your choice—the driver's is the most convenient—and drill four 5/16-inch holes matching the wall mounts for the four 3/4- to 1-inch stainless steel bolts you'll be inserting. Install the bolt head inside and add a stainless steel nut to the bolt end that is slightly protruding outside of the door. Tighten up the nut to the max, put the panel back on and use wingnuts to attach the wall mounts. After this, any 1- to 1 1/2-inch medium-weight masting will make a great mount for your beam. (Your wife wasn't really expecting much resale value for that car, was she?—ed.)

Properly mounted and installed, a two-to six-element 432-MHz beam can be used at highway speeds. A 2-meter beam can be used as well, but just make sure the beam is locked in place so that it doesn't stick out laterally more than 12 inches from the side of your vehicle (see Photo E).

The final antenna choice is the mag-mounted or any standard permanently mounted vertical whip. Your VHF-FM antenna will usually work fine, and you can and will be heard on sideband with a vertical antenna (you can see mine in Photo F), but look for a 10- to 50-mile

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Photo F. While they're less than ideal for SSB work, vertical whip antennas (seen in between the horizontal ones here) can still get you on the air with a decent talk range.

range instead of 50 to 150 miles with the horizontal (due to cross-polarization losses of nearly 20 dB).

## Installation Tips

You'll want to run your power lead directly to the battery with an insulated, stranded wire power cable. Use #12 wire for power levels of up to 25 watts, #10 for 25 to 75 watts, and #8 or larger for 75 watts and up, including your amplifier. Both wires should be fused as close to the battery as possible.

A good quality RG-58U stranded-type coax combines the best properties of size and durability for most mobile installations on the 50- through 450-MHz amateur bands. If you have enough room, RG-8X is even better. Avoid sharp bends in the cable, and avoid often-used doors (if you have to run the cable through a door). Keep cable length reasonably short and use good quality connectors. Coax seal or automotive windshield tape make excellent protectors for an outside connection.

PL-259/SO-239s, also (mis)known as UHF connectors, should work adequately at frequencies up to 450 MHz; although, if you feel confident in your abilities in the miniature assembly field, you might try type "N" connectors for 144 MHz and up.

Next, look for a high-capacity battery for your car. A battery with 600-plus cold cranking amps (CCA) and a reserve capacity of at least 80 minutes will increase the likelihood of your car starting the next morning after leaving the radio on all night. A recent check at the local warehouse store found an 875 cca/165-minute reserve capacity battery for my truck priced at only \$48.00! Look closely at battery specifications, as there are many types and the rating is much

more important than warranty length. If you've got a few extra bucks and some room under the hood, a spare battery is a good investment also.

## More Power, Larger Ears and the Extras

Do you need an amplifier? No, you can do a lot on VHF sideband with only 10 watts, but most mobile ops with room in the budget go for the standard 100- to 170-watt "brick" amplifiers to increase their range to a sensational level! Used

price for one of these is in the \$100 to \$200 range, and new can run you \$200 to \$400. If you get hooked, an amplifier in this range will be a valued investment. Amplifiers fit nicely under front seats or in the trunk compartment, behind the rear seat. Remember to leave at least one inch of air space above and around the amp for temperature protection.

How about a receive preamp? Since cable lengths are short in mobile installations, the only preamps you'll find worthwhile are the ones already in the rig, or build into an amplifier. When you're shopping for an amp, it's worthwhile to pick one with an internal preamp.

An amplified speaker is also a very good investment. Many of those distant stations that would have been part of the road noise using the stock speaker can be heard very well using an external amplified speaker.

## Operating SSB Mobile

Once you've got your mobile VHF sideband station set up, it's time for some fun on the air! But we're just about out of room, so we'll cover the operating end of the picture in Part 2. Between now and then, you can work on putting your SSB mobile station together! ■

## Resources

The equipment suppliers mentioned in this article may be contacted as follows:

### Rigs & Transverters

**Alinco USA**, 438 Amapola Ave., Suite 130, Torrance, CA 90501; Phone: (310) 618-8616; Fax: (310) 618-8758; Internet: <<http://www.alinco.com>>.

**Downeast Microwave, Inc.**, 954 Rt. 519, Frenchtown, NJ 08825; Phone: (908) 996-3584; Fax: (908) 996-3702; Internet: <<http://www.downeastmicrowave.com>>

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**M<sup>2</sup> Antenna Systems, Inc.**, 7560 N. Del Mar Ave., Fresno, CA 93711; Phone: (209) 432-8873; Fax: (209) 432-3059; Internet: <<http://www.m2inc.com>>.

**Olde Antenna Lab**, 41541 Dublin Drive, Parker, CO 80134; Phone: (303) 841-1735; Fax: (303) 841-1354; E-mail: <[w6oal@aol.com](mailto:w6oal@aol.com)>.

# Get 100-Plus Mile Mobile Range on VHF Sideband!—Part 2

If Part 1 of K1MAP's series persuaded you to set up a VHF SSB station in your car, keep reading for Mark's operating tips...which should help you be in the right place at the right time to be heard by hams farther away than you ever thought VHF would work!

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*Editor's Note: In Part 1 of this series, which appeared in the April, 1998, issue of CQ VHF, K1MAP covered the nuts and bolts aspects of setting up a mobile SSB station for VHF—choosing a rig and antenna, installation, etc. This month, Mark concludes with what to do next—maximizing your chances of making contacts as far away as possible.*

Once you've got your mobile VHF sideband station set up, it's time for some fun on the air! The beauty of a mobile setup is that you can use it just about anywhere: on the way to and from work, at lunchtime, in your driveway, on weekends, vacations, while the wife and kids are in the mall, or—the best place of all—on top of that picturesque hilltop you drive up to just before sunset.

## Distance to the Max...

Even if you live in some of the flatter parts of the country, you can still pick a high spot, or just a clear area like an unused parking lot, away from trees and buildings. These locations increase your range by leaps and bounds. If you're lucky enough to live in an area with a relatively clear hilltop of even only 100 to 200 feet above the surrounding terrain, you'll find that a 50-to-100-mile range will

*\*Mark Casey, K1MAP, enjoys VHF/UHF/microwave operating from his home in Hampden, Massachusetts, while mobile and while hiking.*



*If you can drive there, you can operate there—even sometimes on the beach! That's the author's daughter, April, guarding the van.*

increase to 150 or more miles, and that a 150-mile range will go to 200-plus miles.

The other technique for increasing your station's range is to operate at the most likely times of *signal enhancement*. There are many types of enhancement used by the mobile operator, but the most common is *tropospheric ducting*, or just *tropo*. The best times to encounter this

effect on a regular basis are during warm weather, from sunrise to 8:00 or 9:00 a.m., and from just before sunset to several hours after. Summertime is your best bet, but if your weather forecast shows warm air streaming north in mid-winter, expect some tropo. And, as I mentioned in Part 1, tropo increases as you head south, and winter tropo openings are more

commonplace as you head toward the southern tier of states from Florida across to Louisiana, Texas, and California.

## DX Heaven

One of my most memorable mobile contacts took place around sunset on an evening in August of 1996. I was on my way home after a day of hiking in far western Massachusetts, and I stopped to have the last sandwich of the day alongside beautiful Plainfield Pond in the Central Berkshire Hills. Not quite tired of radio after a day of operating portable/backpack (we'll have to cover that subject in another article), I reached up and turned on the sideband rig and called out a few of CQs on 144.200, the 2-meter SSB calling frequency. The first one to come back to me was Del, KD1DU, from southern Connecticut, just about 100 miles distant. A minute later, Ray, WIREZ, joined in from central Maine, and we were up to 250-plus miles. This was getting good! Then Sid, K8ZES, from western New York, came in, putting us in the 300-plus mile distance class and I've got a four-way QSO going with a span of over 500 miles between the two most distant stations and we can all hear each other! My conclusion: tropo works great with mobile operation!

The best of both common VHF/UHF distance enhancers—a high hill and a

good tropo opening—can put the mobile sideband operator in DX heaven! So take a ride in your mobile station, find the best hilltop or open area you can, take a listen, then give a call, and listen for a while again, as sideband operators sometimes take a minute or two to get fired up to respond to your call. And don't forget to ID as a mobile station. While it's not required, base stations just love to talk with mobiles. I think that you'll be pleasantly surprised!

## Who, What, Where & When!

You can also be unpleasantly surprised if you go home from your hilltop with few or no contacts in the log because you picked the wrong time, band, or frequency on which to operate. To keep that from happening, here's what to expect on the sideband portion—always upper sideband on VHF—of the most popular VHF and UHF bands, along with tips on where and when to find the most action (see the Table for a handy reference chart to the most commonly used frequencies on each band):

### 6 Meters

Calling frequencies vary on six, and 50.125, 50.150, and 50.200 MHz are alive daytimes during contests, as well as during the December to January and May to August *E*-skip seasons. And 50.110 is an international-only calling frequency; if you hear something there, you might have a real DX station.

Most other activity is in the evening, especially Sunday night, which is "activity night" (activity nights are specific evenings each week set aside to encourage SSB operation on a particular VHF or UHF band). Many stations monitor 50.125 for DX stations, so if you're going to be on with one station for more than a few minutes, it's best to move up a bit, to say 50.130 or .135. The calling frequencies should be reserved for just that—calling and making brief contacts. Don't worry, other stations will find you even if you move.

### 2 Meters

This is by far the most popular VHF-SSB band, and in many parts of the country, you'll find activity from early morning to late evening on the frequencies between 144.105 and 144.270 MHz. Here, 144.200 is the calling frequency and you'll hear the most activity within

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***"If you're lucky enough to live in an area with a relatively clear hilltop of even only 100 to 200 feet above the surrounding terrain, you'll find that a 50-to-100-mile range will increase to 150 or more miles, and that a 150-mile range will go to 200-plus miles."***

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30 kHz in either direction. Monday evening is 2-meter activity night and you'll see an increase in operators on the band then, and all weekday evenings between 8:00 p.m. and 11:00 p.m.

Since 2 meters has the most activity, this is the band on which you're most likely to experience what serious VHF weak signal operators think are the most rewarding contacts of all: those via long distance tropo and *E*-skip (not to mention aurora and FAI, or Field Aligned Irregularities, which often "opens up" 2 meters after a big sporadic-*E* opening on 6 meters, even if the *E*-skip doesn't make it all the way up to two). Again, many stations monitor 144.200 for DX, so if you're going to be on for more than a few minutes with one station, it's best to move up or down 5 or more kHz.

### Above 2 Meters

There's less activity on these higher bands than on six and two, but with some perseverance, and perhaps a "sked" or two, your mobile station can shine here, as well.

- 1.35 meters—Most SSB activity is in the evenings near 222.100 MHz. Tuesday is activity night, but stations are still sparse. We need more stations on this band, but equipment is difficult to come by. Operate on the call frequency on this band and higher frequency bands to increase the odds of a contact.

- 70 centimeters—Evenings near 432.100 MHz are your best bet. Wednesday is activity night. Microwave operators meet up on this band and on 2 meters to schedule higher frequency contacts.

- 23 Centimeters & Up—Evenings are best, not because the propagation is better, but because that's when the greatest number of people are available. Except during contests, there's generally not enough activity on these bands to have



A two-band mobile setup with omni-directional halo antennas for 6 and 2 meters (the bigger one is for six), plus a 2-meter beam for distance.

## Table. VHF+ Sideband Operating Frequencies in MHz

Calling frequencies are in parentheses.

| Band/Frequencies               | Primary Use(s)      | Notes              |
|--------------------------------|---------------------|--------------------|
| <b>6 Meters</b>                |                     |                    |
| 50.080–.100                    | CW                  |                    |
| 50.100–.125 (.110)             | USB+CW              | International QSOs |
| 50.125–.300 (.125, .150, .200) | USB+CW              | General Use        |
| <b>2 Meters</b>                |                     |                    |
| 144.050–.100                   | CW+EME/CW           |                    |
| 144.100–.275 (.200)            | USB+CW              | General Use        |
| 144.275–.300                   | Beacons             |                    |
| 144.300–.500                   | SSB+CW+FM+AM        | Mixed Use          |
| <b>1.35 Meters</b>             |                     |                    |
| 222.060–.200 (.100)            | USB+CW              | General Use        |
| <b>70 Centimeters</b>          |                     |                    |
| 432.070–.300 (.100)            | USB+CW              | General Use        |
| <b>33 Centimeters</b>          |                     |                    |
| 902.000–.300                   | West Coast USB+CW   | General Use        |
| 903.000–.300 (.100)            | East+Midwest USB+CW | General Use        |
| <b>23 Centimeters</b>          |                     |                    |
| 1296.080–.300 (.100)           | USB+CW              | General Use        |

much success with calling CQ. You'll do best to make a schedule (a "sked") by calling on 144.200 or 432.100 MHz and looking for people who want to talk on the higher bands.

The bottom line for mobile operating is that, if you're in a normal morning and afternoon commute, 6 meters and 2 meters will be your best choices because of higher activity levels. If you travel at off-hours or in the evenings, when more people tend to be on the air from home

(and you have a few extra bucks to spend), you might want to try going mobile on 432 or above.

### Mobile Operating Tips

Mobile operating poses greater challenges than operating from home, because you're generally running less power and smaller antennas than base stations. Plus, you're a moving target if you're talking while driving. Here are



A better look at the author's mobile antennas. From left, his 2-meter beam, 2-meter halo, and 6-meter halo.

***"The best times to encounter [tropo] on a regular basis are during warm weather, from sunrise to 8:00 or 9:00 a.m., and from just before sunset to several hours after."***

some tips for making yourself heard on SSB mobile:

- **Listen**—On the call frequency, for at least a couple of minutes. A mobile usually has some ambient noise from the vehicle which often masks an ongoing QSO.

- **Call CQ**—On the call frequency. It is proper to use "CQ" on VHF, especially when you're using sideband. A minute-long call giving your location relative to the nearest major town (several times) is great, as it gives base stations your direction and time to turn their beams toward you.

- **Listen Again**—Sometimes it takes a while for the dedicated base station weak-signal operator to get on the air (tube-type amplifiers take time to warm up). You'll be surprised to hear a station reply after you've quit calling for a minute or two!

- **Move off the call frequency**—If you're planning to chat longer than a few minutes. Many weak-signal operators monitor the call frequency in search of rare propagation openings and DX stations.

- **Move at least 10 kHz**—Away from other QSOs or from the call frequency if you or the other station are using power greater than 25 watts.

- **To join an ongoing QSO**—Drop in your call between transmissions. Be prepared to call more than once. Most mobiles aren't nearly as strong as base stations, and it may take a while before you're heard. Patience pays off and most VHF weak-signal base station operators will welcome you. They're glad to hear a new station on!

- **Have Fun**—Get as many stations as possible involved, try a new hilltop, try a nice open beach location, try a new band. You'll all have a blast!

***"I've got a four-way QSO going with a span of over 500 miles between the two most distant stations and we can all hear each other! My conclusion: tropo works great with mobile operation!"***